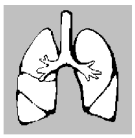
CDHS/CTCA JOINT GUIDELINES
Contact Investigation Guidelines



The following guidelines have been developed by the California Department of Health Services/Tuberculosis Control Branch in consultation with Executive Committee of the California Tuberculosis Controllers Association. These guidelines are official CDHS/TBCB recommendations and have been endorsed by the California Tuberculosis Controllers Association.

Every case of tuberculosis (TB) begins as a contact to a person with active pulmonary or laryngeal TB disease. For this reason, the Centers for Disease Control and Prevention (CDC), the California Department of Health Services (CDHS), and the California Tuberculosis Controllers Association (CTCA) have identified contact investigation as a fundamental strategy for the prevention and control of TB. A contact investigation is the process of identifying, examining, evaluating, and treating all persons who are at risk of infection with *Mycobacterium tuberculosis* (*M. tb)* due to recent exposure to a newly diagnosed or suspected case of pulmonary or laryngeal TB.

Public health goals of a contact investigation are to:

- Terminate transmission
- Identify additional cases and ensure proper treatment
- Prevent the development of disease among contacts

This guideline was developed as a tool for persons in any setting with a role in TB contact investigations, including public health nurses, outreach workers, disease control investigators, translators, social workers, health educators, clinic nurses, physicians, infection control practitioners, etc. The guideline focuses both on what to do and how to do it, and provides process standards to establish a minimum standard of care for conducting contact investigations.
Effective contact investigation activities require administrative direction, commitment, and support. This support includes staff education and training, quality assurance, and allocation of adequate resources. Since case managers must ensure that contact investigations are appropriately conducted, this document should be considered a companion guideline to the CDHS/CTCA, " TB Case Management - Core Components," (5/98).

A contact investigation should be conducted for all suspected or confirmed cases of pulmonary and/or laryngeal TB. Since TB transmission does not occur (except under highly usual circumstances) from patients with extra pulmonary TB, a contact investigation is neither necessary nor appropriate for cases which are only extra pulmonary. Pediatric TB cases and certain children with positive tuberculin skin test (TST) results may require an investigation to determine the source of their infection. Source case investigation will be addressed in another CDHS/CTCA guideline which is under development.

Local health departments (LHDs) should prioritize contact investigations depending on local resources and should ensure that the most infectious cases and suspects have a prompt and thorough contact investigation. A systematic approach to contact investigations is essential to focus investigative efforts and ensure that resources are spent providing services to persons who are most at risk for TB infection or disease. LHDs should assess their ability to meet objectives for contact investigations contained in **Appendix 1: Objectives for Contact Investigations**.

This guideline is organized into three major sections:

- The first consists of eight (8) subsections that describe the process of the contact investigation and includes activities in typical sequence.
- The second major section contains nine (9) appendices that provide additional detail.
- The third major section contains tools to assist local jurisdictions with contact investigation activities (see **Table of Contents**).

Definitions

For the purpose of this guideline, the following definitions apply:

Index case: A suspected or confirmed case of pulmonary or laryngeal TB. For definitions and examples of suspected and confirmed TB cases, refer to CDHS/CTCA, "Joint Guidelines for Reporting Tuberculosis Suspects and Cases in California," (10/97).

Contact: A person who has shared air with the index case.

High-risk contact: A contact (either close or casual) who is at high-risk of progression from TB infection to TB disease and/or is likely to suffer increased morbidity or mortality from TB disease. A high-risk[1] contact has one or more of the following characteristics:

- Under age four
- Infected with HIV, or who is at risk for HIV infection (See **Definition**, *At Risk for HIV Infection* below and **Appendix 3: Factors Associated with Increased Risk of HIV Infection** for a list of factors associated with risk of HIV infection).

Since clinically active disease can occur very rapidly once infected, high-risk contacts must receive prompt medical evaluation.

Close contact: A person who has prolonged, frequent, or intense contact with an index case during the case's period of infectiousness. Whether a person is a close contact also depends on:

- Physical proximity to the index case
- The environment in which exposure to the index case occurs.

Examples of close contacts include, but are not limited to, persons who:

- Carpool with the index case several days per week
- Share the same house or room as the index case
- Spend time with the index case frequently
- Share air in small, enclosed spaces with little natural or mechanical ventilation.

[1] In certain situations, clinicians may consider persons with other immunocompromising conditions to be high-risk contacts. **Appendix 2** contains a list of conditions that may result in immunosuppression and an increased risk of progression to TB disease. Medical management of contacts with these conditions should be individualized based on the contact's risk of immunosuppression and on evidence of transmission in the contact investigation.

Casual contact: A person who has less prolonged, intense, or frequent contact with the index case than close contacts.

Examples of casual contacts include, but are not limited to, persons who:

- Visited the index case occasionally
- Visited the index case weekly for a short time.

Non-contact: A person who has probably not shared air with the index case but who requested inclusion in the contact investigation, i.e. a worried person who was probably not exposed.

Examples include, but are not limited to, a person who:

- Shared an elevator ride with the index case
- Was exposed to the index case outdoors only.

At Risk for HIV Infection: Presence of behaviors or conditions associated with increased risk of HIV infection (see **Appendix 3: Factors Associated with Increased Risk of HIV Infection**), unless the person is known to be HIV negative for at least 6 months following the last possible HIV exposure or risk behavior.

Period of Infectiousness: The period during which the index case was most likely able to transmit TB to others (See **Appendix 4**: **Defining a Likely Period of Infectiousness**)

Window prophylaxis: The practice of providing preventive therapy to a high-risk contact whose initial tuberculin skin test (TST) result is negative before the result of the follow-up TST is available. At the time of the follow-up TST, a decision about whether to continue preventive therapy is made.

For example:

- A two-year old child is named as a household contact to an AFB smear negative index case. The contact's initial TST is negative and she is started on preventive therapy after TB disease has been ruled out. Twelve weeks later, when the contact's follow-up TST result is also negative, preventive therapy is discontinued.

PROCESS OF THE CONTACT INVESTIGATION

Documenting Contact Investigation Activities

I. Rationale

A. Helps to ensure appropriate and complete identification, evaluation, and medical management of contacts.

B. Facilitates timely interjurisdictional referrals and follow-up of contacts.

C. Provides information needed to make key decisions in the investigation, including expanding investigation to the next concentric circle.

D. Preserves essential information over time.

E. Permits consistent use of information by all persons involved in the investigation, in spite of personnel changes.

F. Facilitates complete and organized analysis for future programmatic use, including program evaluation and revising program priorities.

II. Key activities include completion of the following:

A. Index case report

B. Contact roster (See **TOOLS, Sample Contact Roster**)

C. Analysis and summary of the contact investigation

Collecting and Evaluating Initial Index Case Information

This section addresses only the collection of patient information for the purpose of a contact investigation. See CTCA/CDHS, "TB Case Management – Core Components," (5/98) for a complete review of information that should be obtained from the case.

I. Timeframe

A. Preliminary risk assessment of the index case should be completed within one (1) working day of receipt of case report by LHD (see the Algorithm in **Appendix 5: Contact Investigation Process and Maximum Timeframes** for the process and timeframes of the contact investigation).

B. Case report should be completed within three (3) working days of receipt by LHD, and preliminary risk assessment revised, as necessary.

II. Conduct a preliminary risk assessment

A. Upon receipt of the case report, staff should immediately assess the following:

1. Index case's infectiousness

2. Whether transmission may have occurred in settings containing a large number or high density of persons, if known

3. Whether there are high-risk contacts, if known

B. Based on this initial assessment, determine the timeframe and urgency of the contact investigation. For example, if the index case were an AFB sputum smear negative mother of a two-year old, the timeframe for the index case interview would be 3 days.

C. Revise preliminary risk assessment, if necessary, when case report is completed.

III. Review, and complete the case report

A. Review the initial report of confirmed or suspected case of pulmonary or laryngeal TB and identify information gaps.

B. Obtain the following information about the index case, and as much information as available about contacts and the settings in which the case may have shared air with others:

1. Identifiers

a. Full name and any aliases
b. Date of birth (including those for aliases)
c. Locating information (e.g., address, telephone number, next-of-kin, emergency contact persons)

2. Disease-related information

a. Site of disease
b. Symptoms—type, severity, and onset date
c. Chest x-ray results including dates and extent of disease
d. TB medications including dosages, and start and stop dates
e. Bacteriological results for acid fast bacilli (AFB) smears and cultures, including sources and collection dates, and drug susceptibility results.

Note: Obtain the name and telephone number of the laboratory where the specimen was sent in order to verify laboratory findings

f. Previous history of TB disease or infection and treatment received

g. Medical conditions that may increase the progression to TB disease (see **Appendix 2: Medical Conditions Associated with Increased Risk of Progression to TB Disease**)
h. Psychosocial conditions (e.g., substance abuse, mental illness, and socioeconomic status)

3. Contact information, if available

a. Names and locating information
b. High-risk contacts
c. If contacts have already been evaluated

4. Settings in which index case may have transmitted TB, if available

a. Living situation (e.g., type, congregate setting, cohabitants) and associated timeframes
b. Employment history/work site information (e.g., site, shift, full/part time, absences)
c. School (e.g., site, full/part-time schedule, absences)
d. Social/recreational activities (e.g., choir, bar) and frequency and number of other people present

C. Obtain missing information about the index case from: the patient's provider or reporting source, laboratories, radiology departments, and pharmacies.

D. Missing information about contacts or settings in which transmission may have occurred should be obtained during the index case interview.

Interviewing the Index Case

I. Timeframes

A. Interview the index case within three (3) working days of receipt of the report if:

1. Index case is AFB sputum smear positive, unless a nucleic acid amplification test (NAAT) has been done and the result is negative, *or*

2. Contacts are known to be high-risk contacts (see **Appendices 1** and **2**).

Note 1: Although AFB sputum smear positive/NAAT negative cases are unlikely to have TB, interviews of index cases who reside in high-risk settings should be conducted within three working days if there is other evidence suggestive of TB.

Note 2: If AFB sputum smear positive/NAAT negative cases occur in the community, index case interviews may be delayed until *M.tb* culture results are available, unless there is compelling evidence of TB.

B. Interview AFB sputum smear negative index cases within seven (7) working days.

II. Index case interview

A. For methods of notifying and interviewing the index case, see **Appendix 7: Overview of Methods of Notifying and Interview Index Cases and Contacts**, and **RESOURCES**, **Tuberculosis Patient Interview Guide, 1996**.

B. Interview should be conducted in the home (any place where the patient dwells and conducts day-to-day living activities, including a house, apartment, shelter, under a bridge, congregate living site such as prison or nursing home). The importance of the home visit cannot be overemphasized, because it may:

1. Reveal information that index case may not initially provide about contacts (e.g., children's toys, shoes) and risk factors (e.g., drug paraphernalia).

2. Provide opportunity to identify and resolve discrepancies between the index case's answers to interview questions and observations about contacts and risk factors.

C. If the index case is hospitalized, the interview should be conducted in the hospital within the timeframes listed in **Interviewing the Index Case,** I above.

D. If the index case cannot be interviewed in the home, a home visit remains necessary within the following timeframes:

1. Three (3) working days following completion of case report/preliminary risk assessment for smear positive index cases, or if high-risk contacts may be involved.

2. Seven (7) working days following completion of case report/preliminary risk assessment for smear negative index cases and if high-risk contacts are not likely to be involved.

E. If the index case is infectious (as defined in **Appendix 4: Defining a Likely Period of Infectiousness**, IV), the interviewer must be provided and required to use a NIOSH-certified respirator and be fit tested.

III. Key Interview/Assessment Activities

A. Establish rapport with the index case and reassure him/her of confidentiality.

B. Provide information and materials about TB, TB transmission, and preventive therapy.

C. Confirm information with the index case that has already been obtained from other sources and try to rectify conflicting information.

D. Obtain additional information about the index case's potential level of infectiousness or other needed clinical data (e.g., how long has (s)he been symptomatic?).

E. Define a likely period of infectiousness (see **Appendix 4**: **Defining a Likely Period of Infectiousness**).

F. Determine settings in which the index case may have transmitted TB during the entire likely period of infectiousness.

1. Question index case about changes (e.g., moving, switching jobs, incarceration) that may have occurred during the entire likely period of infectiousness.

2. Ask about any settings in which the index case may have transmitted TB

   a. Environmental factors such as room size and sources of fresh air (e.g., open windows, doors) which may affect the risk of transmission in these settings. For example: How many windows are in your office? Are they usually open?
   b. Characteristics of population(s) present.
   For example: What is the age range of the children in the after school program at which you volunteer?
   c. Approximate number of people present.
   For example: About how many people are there in your church choir?

3. Ask about the amount of time the index case spent in any setting.
   For example: How many hours a week do you spend at Joey's Bar?

G. Identify potentially exposed contacts for the entire likely period of infectiousness. Remember that the index case's current close contacts may be different now than during other periods within his/her likely period of infectiousness.

1. Obtain the following information about each potential contact

   a. Names and locating information
   b. Date of birth or age
   c. TB medical information (e.g., presence of symptoms and date of onset, TST history, potential sources of TB) and where medical evaluation done, if known
   d. Presence of risk factors (i.e., age < 4 years, HIV infection, risk factors for HIV infection contained in Appendix 3, or other medical conditions listed in **Appendix 2: Medical Conditions Associated with Increased Risk of Progression to TB Disease**)
   e. Duration, frequency, and proximity of each potential contact's exposure to the patient

2. Classify persons as close or casual contacts, or as non-contacts.

3. Establish which contacts may be high-risk contacts.

H. Obtain locating/demographic/risk factor information (home, work, school, and social/recreational activities) for the identified contacts.

I. Assess the likelihood of index case's adherence and the need for Directly Observed Therapy (DOT). See CDHS/CTCA, "Directly Observed Therapy Program Protocols in California," (4/97).

IV. Reinterviews

A. Assigned staff are unlikely to obtain complete contact information in only one interview because the index case may:

1. Feel sick

2. Not yet have developed trust with staff

3. Not be able to immediately recall all of his/her contacts

4. Be anxious about his/her diagnosis or other issues

5. Be worried about confidentiality of information (See **Appendix 6*:* Protecting Index Case Confidentiality**)

B. All index cases must be reinterviewed one or more times to ensure that accurate and complete contact information is elicited. Reinterviews may be conducted in the clinic.

Establishing Contact Investigation Priorities

I. Review and verify essential index case and contact information obtained from the medical chart and interview write-up, and obtain hardcopy of all index case diagnostic test results, including laboratory, radiographic, and TST. Address information gaps promptly.

Note: Since a timely contact investigation is critical to TB control, it is important to proceed with the investigation, even if this information is incomplete.

II. Prepare contact roster (see **TOOLS, Sample Contact Roster**)

III. Prioritize and establish timeframes for contact follow-up.

A. Use the concentric circle approach (see **TOOLS, Using the Concentric Circle)** to help organize information about contacts and establish contact tracing priorities.

B. See **TOOLS, Prioritizing Activities: Contact Investigation Priority Scoring System** for assistance in setting priorities in contact investigations.

Interviewing and Assessing Contacts

I. Interviewing contacts

A. Purpose of contact interview:

1. Assess whether contact is a high-risk contact

2. Ensure contacts receive timely and appropriate medical evaluation and follow-up

3. Identify contact's potential adherence barriers

4. Obtain additional index case information when feasible and confidentiality is ensured (e.g., additional contacts)

B. Content of contact interview:

1. For methods of notifying contacts, see **Appendix 7: Overview of Methods to Notify and Interview Index Cases and Contacts**.

2. Establish trust and rapport, confirm contact's identity, explain confidentiality and nature of visit.

3. Personal information: home and work addresses and telephone numbers; date of birth; aliases and dates of birth; nicknames; place of birth; date of arrival in US.

4. Current TB exposure: assess contact's knowledge of exposure (i.e., has the index case already informed the contact about the exposure?); if possible confirm dates, duration, frequency, and intensity of exposure to the index case; determine if the contact has already sought care for this exposure; identify additional potential contacts who may also need follow-up, provide TB education as needed.

5. TB history: prior TB exposure, dates and results of prior TSTs, history, or treatment for disease or infection, BCG history, travel to TB endemic areas.

6. Current signs and symptoms suggestive of TB: type, severity, and onset and duration of each; arrange immediate evaluation of symptomatic contacts.

7. Medical history: chronic medical conditions (e.g., HIV status, diabetes, cancer, or other immunosuppressive conditions), current medications, medication allergies.

8. HIV risk factors and history of HIV testing (see **Appendix 3: Factors Associated with Increased Risk of HIV Infection**).

9. Adherence assessment: throughout the contact interview, assess the contact's psychosocial needs and other risk factors that may influence future adherence; problem-solve and use incentives/enablers as needed.

10. Referral for evaluation: identify health care sources and make appropriate referrals (e.g. clinics, social services, drug treatment, housing, HIV testing)

11. Additional index case information: When appropriate, interview the contact about the index case in order to verify current information and/or obtain new information. For example, if the index case's wife knows her husband has TB, she may be interviewed about his adherence, risk factors, symptom history, and his other potential contacts.

C. For contacts who reside in other jurisdictions, see **Appendix 8**: **Addressing Interjurisdictional Issues**.

II. Reprioritizing Contacts

A. While assigned staff initially prioritized contacts based on information obtained from the index case, staff must analyze information obtained through contact interviews to determine if contacts should be reprioritized. This ensures staff focus on contacts who need prompt evaluation. Determine if contact is:

1. Close vs. casual

2. High-risk vs. not high-risk

B. Revise contact roster and concentric circle as needed. For example, a contact who was initially considered a not high-risk, casual contact based on the *index case* interview, may now be considered a high-risk, close contact based on additional information obtained through the contact interview.

Ensuring Timely and Appropriate Medical Management of Contacts

I. Timeframes associated with medical management of TB contacts depend on whether

A. Index case has the following

1. AFB sputum smear positive vs. negative

2. Positive vs. negative culture or NAAT for *M. tb*

3. Minimal vs. extensive (e.g., cavitation, bilateral infiltrates) TB disease on chest x-ray

B. Contact is:

1. High-risk vs. not high-risk

2. Close vs. casual

C. Transmission may have occurred in a setting in which there are a large number or high density of potential contacts (e.g., shelter, correctional or health care facility, school, office).

II Recommended timeframes for the following activities in initial contact follow-up are indicated in **Table 1** below:

A. Screening, defined as:

1. Contact interview, *and*

2. Symptom screen, *and*

3. TST placement and reading, if indicated.

B. Medical evaluation, defined as:

1. History and physical exam, *and*

2. Chest x-ray and, if indicated, *and*

3. Bacteriologic studies, if indicated, *and*

4. Initiation of preventive therapy, if indicated, *and*

5. Initiation of treatment for active disease, if indicated.

Table 1. Timeframes for Initial Contact Follow-Up

Type of Contact	**Working Days from Identification of Contact to Completion of Screening** (see **Ensuring Timely and Appropriate Medical Management of Contacts,** III and IV below)	**Working Days from Completion of Screening to Completion of Medical Evaluation** (see **Ensuring Timely and Appropriate Medical Management of Contacts,** V below)
High-risk Contact (close or casual) regardless of index case's smear results, *or* *Close Contact* to AFB sputum smear *positive* index case[2]	5	5
Close Contact (who is *not a High-risk* Contact) to AFB sputum smear *negative* index case, *or* *Casual Contact* (who is *not a High-risk Contact*), regardless of index case's sputum smear result	10	10
High-risk Contact or *Close Contact* to index case with *negative* AFB sputum smear and *negative* culture for *M. tb.*	15	30

Note 1: Symptomatic contacts need immediate referral and evaluation, regardless of type of contact or index case characteristics.

Note 2: Timeframes in above table do not include timeframes for completion of initial index case interview, i.e., three (3) working days from receipt of case report for sputum smear positive index cases or known high-risk contacts, and seven (7) working days from receipt of case report for sputum smear negative index cases and no known high-risk contacts. For maximum timeframes for all contact investigation activities, see **Appendix 5: Contact Investigation Process and Maximum Timeframes**.

Note 3: If transmission may have occurred in a high-risk congregate site, timeframes for evaluations of contacts should be shortened. See CDHS/CTCA, "Guidelines for Coordination of TB Prevention and Control by Local and State Health Departments and California Department of Corrections," (5/98) in which shorter maximum timeframes are specified.

Note 4: If the index case is identified by a positive *M. tb* culture, the timeframes listed in the table still pertain.

[2] If the index case is NAAT negative, consider on a case-by-case basis using the timeframes listed in the row immediately following. Other factors to weigh in determining which timeframe to use include, but are not limited to, the prevalence of TB disease and non-tuberculosis mycobacterial infections in the population.

III. Tuberculin Skin Testing

A. For contacts without documented prior positive TSTs, place Mantoux tuberculin skin test with 0.1 cc of 5 TU PPD tuberculin during the initial visit and read 48-72 hours later[3].

1. For contacts with TST result < 5 mm, no further testing is necessary if:

a. More than twelve weeks have elapsed since last exposure to the index case, *or*
b. More than twelve weeks have elapsed since the index case was infectious.

2. For contacts with TST result < 5 mm, repeat TST:

a. 10-12 weeks after last exposure to index case, *or*
b. 10-12 weeks after index case is no longer infectious if contact not broken, *or*
c. 10-12 weeks after initial test.

Note: Repeat testing is not necessary if the initial test was placed ≥ 12 weeks after the last contact with the index case.

3. For contacts with TST result < 5 mm, and with continuing contact with an infectious case, repeat TST every 12 weeks.

B. Contacts with documented prior positive TST do not need a TST.

C. Contacts with history of BCG: place, read, and interpret TST without regard to BCG history.

IV. Ensure medical evaluation

A. All contacts meeting any of the following criteria should receive medical evaluation. It is recommended that both PA and lateral chest x-rays be obtained for children 12 years of age or less because the thymus may obscure the presence of adenopathy.

1. Symptoms of TB disease (immediate referral required)
Preventive therapy should not be initiated until TB disease has been ruled out.

2. TST result < 5 mm

a. High-risk contacts
b. Other persons if:
1) Evaluation of other contacts with similar exposure demonstrates a high probability of infection.
2) Circumstances of exposure suggest a high probability of infection.

3. TST result ≥ 5 mm

[3] Controversy exists regarding the utility of two-step TST in contact investigations. In general, CDC does not recommend two-step testing in contact investigations.

B. Refer contacts at risk for HIV infection (see definition and Appendix 3 for factors associated with increased risk of HIV infection) for HIV counseling and testing

Note: Persons with HIV risk factors who are not known to be HIV negative for at least 6 months following their last possible HIV exposure or risk behavior should be counseled regarding HIV risk reduction and offered confidential HIV testing. While HIV test results are pending, such persons should be managed as high-risk contacts until known to be HIV negative at least 6 months after their last possible exposure or risk behavior. When confidential HIV testing is refused, anonymous HIV testing should be offered.

V. Indications for preventive therapy for contacts

A. For information about preventive therapy for contacts, see **Appendix 9: Preventive Therapy for Contacts**, and CDHS/CTCA, "Treatment of Tuberculosis Infection in Adults and Children (TB Class II and IV)," (4/97).

B. TST < 5 mm, after TB disease is ruled out by clinical exam, chest x-ray, and other diagnostic tests, as appropriate (window prophylaxis of TB Class I)

1. High-risk contacts

2. Other persons if:

a. Evaluation of other contacts with similar exposure demonstrates a high probability of infection
b. Circumstances of exposure suggest a high probability of infection

C. TST ≥ 5 mm, after TB disease is ruled out by clinical exam, chest x-ray, and other diagnostic tests, as appropriate (TB Class II)

1. High-risk contacts

2. Close contacts who are not high-risk contacts

3. Preventive therapy for casual contacts who are not high-risk contacts should be recommended on a case-by-case basis. Factors such as the following may be considered in this assessment:

a. Evidence of extensive vs. minimal transmission among casual contacts with similar exposure
b. Probability that infection has resulted from remote vs. recent exposure
c. Benefits vs. risks (e.g., age ≥ 35 years old, history of hepatitis) of preventive therapy for the contact

D. If documented history of a prior positive TST, consider for preventive therapy if otherwise indicated, apart from circumstances of recent contact.

E. Contacts who have completed an adequate course of preventive therapy

1. Contacts who are not high-risk contacts and who have completed adequate preventive therapy generally do not need preventive therapy again.

2. High-risk contacts with HIV infection or at risk for HIV infection should be reevaluated and given preventive therapy again.

3. Children under age 4, and contacts with medical conditions other than HIV infection associated with increased risk of progression to TB disease (see **Appendix 2: Medical Conditions Associated with Increased Risk of Progression to TB Disease**) should be reevaluated. If judged to be significantly immunosuppressed, preventive therapy may be considered again.

VII. Medical Management of Contacts with Documented Previously Positive TST

A. Screen for TB symptoms

B. If symptomatic, refer for immediate evaluation, including chest x-ray.

C. Contact who is asymptomatic and not a high-risk contact

1. Evaluate for factors that may increase the risk of re-infection regardless of prior history of preventive therapy (e.g., evidence of transmission in the contact investigation, AFB smear positive index case, cavitary disease in the index case)

2. Refer to clinician to assess need for preventive therapy if significant risk of re-infection is present

D. Contact who is asymptomatic and has HIV infection or risk factors for HIV infection

Refer for chest x-ray, and recommend a full course of preventive therapy, regardless of treatment history for TB infection or disease. If chest x-ray is abnormal, handle as a TB suspect.

VIII. Medical Management of Contacts Who Are Evaluated by non-LHD Providers

A. LHD may refer contact to a non-LHD provider for TST, medical evaluation, and follow-up at patient's request and at case manager's discretion. [see CDHS/CTCA, "Guidelines for Oversight of Tuberculosis Care Provided Outside the Local Health Department Tuberculosis Program," (4/97)]

B. Responsibilities of the case manager:

1. Ensure provider understands recommendations for TST, medical evaluation, and follow-up of contacts.

2. Assess and address potential barriers to timely follow-up with the private provider. Ensure follow-up is managed appropriately.

3. Verify and obtain, in a timely manner, results of TST, evaluation, and follow-up, including symptom screen, chest x-ray, other diagnostic lab tests, and treatment.

4. Local health department should assess quality of care in the private sector and offer medical education to providers regarding TB diagnosis and management, as needed.

IX. Remedies when contacts do not comply with screening, exam, and/or preventive therapy recommendations

A. Legal orders may be issued by the Health Officer or TB Controller requiring the contact to comply with screening and exam recommendations (see Health and Safety Code §121363, §121364, §121365 and §120175).

B. When parents/guardians of contacts < 18 years old do not assist in contacts' follow-up

1. Consider informed refusal, signed by parents/guardians, when preventive therapy for contacts < 18 years old is declined.

2. Consider referral to Child Protective Services.

X. Medical Management of Non-Contacts

A. Self-described contacts who meet the definition of a non-contacts and request testing should be treated as screening subjects only, with evaluation or referral to private medical providers for follow-up, per local protocols. Offer education and skin testing for reassurance only as resources allow.

B. Screened non-contacts should not be identified as contacts on the contact roster.

Ongoing Management and Preliminary Analysis of the Contact Investigation

I. Determine if the contact list appears complete

A. Review the index case's medical record and case management notes for clues about previously unidentified contacts (e.g., index case did not list any child contacts, but chart notes that patient could not make an appointment because he was babysitting). Reinterview the index case (see **Interviewing and Assessing the Index Case**, III on reinterviews).

B. Review notes to determine if contacts originally named by the index case indicated that additional persons need follow-up.

II. Ensure complete and appropriate medical evaluation and treatment

A. Ensure documentation is complete for:

1. Index case: final diagnosis, drug-susceptibility results, adherence, sputum culture conversion, and follow-up chest x-ray status are critical for ongoing analysis, and completion of RVCT

2. Contacts: initial and follow-up TST, chest x-ray, symptoms, medication type and start and end dates, risk-status, degree of exposure (close or casual), and diagnosis (TB classification).

III. Determine if transmission has likely occurred

A. Review contact evaluation results.

B. Transmission may have occurred if the investigation reveals:

1. Documented converters

2. Secondary cases

3. TB infection prevalence among contacts is higher than expected

To accurately determine if the infection prevalence is higher than expected, each local TB control program should establish and maintain a surveillance program that, at minimum, collects information about background or baseline TST positivity by age, country of origin, and race/ethnicity. There is no TB infection prevalence rate that can be used in all situations.

C. Interpreting TST results in BCG-vaccinated contacts and contacts from countries with a high prevalence of TB.

Staff should seek supervisory guidance or refer to local protocols on this subject before determining if transmission has occurred.

1. May be impossible to differentiate between conversion or boosting

2. For clinical purposes, new TB infection should be assumed with a positive TST result.

3. To determine if transmission has occurred, a contact's BCG status or possible prior TB infection will play a role in designating a positive TST result as a conversion.

D. Interpreting TST results in immunosuppressed contacts

1. Increased likelihood of false negative TST results can make it difficult to determine if transmission has occurred.

2. If transmission cannot be ruled out among inner-circle close contacts because of immunosuppression, testing should include casual contacts who were not previously tested.

IV. Expand the concentric circle if there is evidence that transmission occurred (see **TOOLS, Using the Concentric Circle**).

V. Update index case information

A. Obtain and record culture result.

B If culture negative for *M.tb*, consult with physician to determine if suspect will be classified as a case or ruled out for TB.

1. If the index case has been ruled out for TB, discontinue the contact investigation.

2. If the case is culture negative or if TB has been ruled out, discontinue INH preventive therapy for TB Class I contacts (window prophylaxis), unless otherwise indicated.

C. If culture positive for *M.tb*, obtain and record drug-susceptibility results to ensure that the index patient and contacts are receiving appropriate therapy.

D. Monitor AFB sputum smear results every two (2) weeks and culture results monthly until persistently negative.

1. If sputa specimen(s) remain bacteriologically positive after 2 months of treatment or become positive after initially converting to negative, determine and address reasons.

2. Failure to convert to negative sputum smear may result in additional contacts needing evaluation, prolongation of preventive therapy for Class I contacts, and follow-up TST until 3 months after culture conversion of index case, if contact not broken.

Table 2. Overview of Ongoing Management Activities and Maximum Timeframes

ACTIVITY	PURPOSE	MAXIMUM TIME INTERVAL
Review all documentation	To ensure that contact list is complete	Ongoing
Review and assess completeness of each contact's medical follow-up	To ensure appropriate and complete medical follow-up	5 working days after each contact's medical evaluation should be completed
Determine if transmission occurred	To decide whether to expand evaluation to next concentric circle	At completion of follow-up testing in a concentric circle, or if secondary cases identified
Obtain and review drug-susceptibility results	To determine if contacts are receiving appropriate preventive therapy	1-2 months after the index case's initial sputum collection date
Repeat TST if contact initially TST negative	To determine if contact has converted (TB Class I to TB Class II)	10-12 weeks after each contact's initial TST
Reevaluate contacts who were initially TST negative and started on preventive therapy (window prophylaxis for a TB Class I contact)	To determine if preventive therapy should be continued	10-12 weeks after each contact's initial TST
Assess contacts' adherence with medical follow-up and TB medication	To remove barriers and ensure timely and complete evaluation and follow-up	Monthly, at time of each visit
Ensure contacts are monitored for adverse reactions and toxicity of preventive therapy regimens according to CDHS/CTCA, "TB Case Management - Core Components," (5/98), **Ongoing Follow-Up,** II)	To prevent development of adverse effects and toxicity from drug regimens.	At least monthly while on preventive therapy
Evaluate problems and concerns that arise that may delay and hamper contact investigation	To remove barriers and ensure timely and complete evaluation and follow-up	Whenever problems identified

Summarizing and Concluding the Contact Investigation

When all contacts identified as appropriate for testing have been evaluated, the contact investigation is concluded. It is important to summarize the investigation and ensure that all contacts started on preventive therapy complete a recommended course of therapy.

I. The contact investigation summary should be documented in a concise manner and include, but be not limited to, the following:

A. Index case characteristics (see **TOOLS, Sample Contact Roster**, top section).

B. Summary results of evaluations in each setting in which the index case may have transmitted TB, including home, work/school, and leisure.

C. Summary results of the entire investigation. The following summary is suggested at a minimum:

1. Number of contacts evaluated
   Number of identified contacts appropriate for evaluation

2. Number of contacts with newly positive TST and documented conversions
   Number of contacts evaluated

3. Number of documented TST converters
   Number of contacts evaluated

4. Total number of TST positive contacts
   Number of contacts evaluated

5. Number of new TB cases found
   Number of contacts evaluated

6. Number of contacts that started preventive therapy
   Number of contacts appropriate for preventive therapy

7. Number of contacts that completed preventive therapy
   Number of contacts who started preventive therapy

Note: Evaluated means completed screening as described on page 11, including follow-up TST, if appropriate, and medical evaluation, as described on page 12.

II. The contact investigation conclusion should include, but is not limited to, the following

A. Final contact management recommendations

B. Lessons learned from the investigation: how the program can be strengthened to better prevent/contain TB

C. Results of RFLP analysis of related cases, if done.

Note: No set of guidelines can cover all individual contact investigation situations that can and will arise. Thus, when questions on individual situations not covered by these guidelines arise, consult with your TB Controller or the California Department of Health Services, TB Control Branch, for consultation and further information.

APPENDICES

Appendix 1: Objectives for Contact Investigations

The following objectives for contact investigations have been adapted from the CDC[4]:

I. At least 95 percent of infectious suspects and confirmed TB cases will have contacts identified.

II At least 95 percent of known contacts to infectious suspects and confirmed TB cases will receive examinations.

III. At least 95 percent of known infected contacts under 15 years of age will be placed on preventive therapy.

IV At least 75 percent of known infected contacts 15 years of age or older will be placed on preventive therapy.

V. At least 90 percent of known infected contacts under the age of 15 placed on preventive therapy will complete a minimum of six continuous months of preventive therapy.

VI. At least 75 percent of known infected contacts 15 years of age or older placed on preventive therapy will complete a minimum of six continuous months of preventive therapy.

[4] Department of Health and Human Services Centers for Disease Control and Prevention. Announcement 700: TB Elimination Cooperative Agreements National TB Program Objectives, CY 1997. p 10-11.

Appendix 2: Medical Conditions Associated with Increased Risk of Progression to TB Disease

I. Medical conditions[5] which have been reported to increase the risk of progression from TB infection to disease include, but are not limited, to the following:

A. HIV infection (see **Appendix 3: Factors Associated with Increased Risk of HIV Infection**)

B. Diabetes mellitus

C. Prolonged therapy with steroids

D. Immunosuppressive therapy

E. Hematologic and reticuloendothelial diseases (e.g., leukemia or Hodgkin's disease)

F. Injection drug use in persons known to be HIV-negative

G. End-stage renal disease

II Clinical situations associated with substantial rapid weight loss or chronic undernutrition:

A. Intestinal bypass surgery for obesity

B. Gastrectomy

C. Chronic malabsorption syndrome

D. Chronic peptic ulcer disease

E. Chronic alcoholism

F. Cancer of the oropharynx and upper gastrointestinal tract

[5] American Thoracic Society. Treatment of Tuberculosis and Tuberculosis Infection in Adults and Children. Am J. Respir Crit Care Med, 1994; 1359-1374.

Appendix 3: Factors Associated with Increased Risk of HIV Infection

Behaviors or conditions [6] [7] which are associated with increased risk of HIV infection include, but are not limited, to the following:

I. Parenteral

A. Injection drug use involving shared needles

B. Blood or body fluid exposure (e.g., occupational exposure in health-care or clinical laboratory setting)

C. Blood transfusion between 1980-1985

D. Transfusion of clotting factor for hemophilia/coagulation disorder

II. Sexual

Unprotected sex with male, female, or transgender partners who have HIV infection or HIV risk factors, including, but not limited to, the following:

A. Risk factors listed in Sections I, III, and IV in this Appendix

B. Multiple sexual partners, including exchange of sex for drugs or money

C. Other sexually transmitted diseases (STDs)

III. Congenital

Children of mothers with HIV infection or who have any of the risk factors listed above

IV. Recipient of tissue/organs or artificial insemination

Note: Persons with the above behaviors or conditions who are not known to be HIV negative for at least 6 months following their last possible HIV exposure or risk behavior should be counseled regarding HIV risk reduction and offered confidential HIV testing. While HIV test results are pending, such persons should be managed as high-risk contacts until known to be HIV negative at least 6 months after their last possible exposure or risk behavior. When confidential HIV testing is refused, anonymous HIV testing should be offered.

[6] California Department of Health Services Office of AIDS. HIV Counseling and Testing Guidelines: Policies and Recommendations, 1997.

[7] Centers for Disease Control and Prevention. Adult HIV/AIDS Confidential Case Report (Form CDC 50.42A Rev 09-93) and Pediatric HIV/AIDS Confidential Case Report (CDC 50.42B Rev. 07-93).

Appendix 4: Defining a Likely Period of Infectiousness

Staff need to identify the time period during which the index case was likely to be infectious. This helps ensure that efforts are focused on identifying, evaluating, and treating persons to whom TB has most likely been transmitted. There is no known well-established, scientific method to determine an index case's period of infectiousness. Each LHD should establish criteria to determine the beginning of the likely period of infectiousness for the purpose of identifying contacts to the index case.

I. Establishing criteria for the beginning of the likely period of infectiousness

As a general rule, the following beginnings of the likely periods of infectiousness are recommended:

Index Case Characteristics				**Recommended Minimum Beginning of Likely Period of Infectiousness** (See Section III below for revising the beginning of the likely period of infectiousness)
TB Symptoms		**AFB Sputum Smear Positive** [8]		
No	**Yes**	**No**	**Yes**	
U		**U**		8 weeks prior to date of first positive finding [9] consistent with TB
	U	**U**		10 weeks prior to symptom onset, *or* 10 weeks prior to date of first positive finding consistent with TB
U			**U**	12 weeks prior to first positive finding consistent with TB
	U		**U**	10 weeks prior to symptom onset *or* 12 weeks prior to first positive finding consistent with TB (whichever is longer)

II. Review index case characteristics

A. Date of symptom onset and duration of symptoms (especially cough) before treatment is initiated. **Note:** If feasible, confirm the index case's symptom history with close contacts.

B. Extent of disease (e.g., cavitary disease on chest x-ray or AFB smear positive disease usually indicates of lengthy communicability)

[8] To ensure validity of AFB sputum smear results, sputa should be collected on 3 consecutive days, and AFB smears should be obtained form concentrated sputum specimens, per Public Health Mycobacteriology: A Guide to Level III Laboratories. Centers for Disease Control and Prevention, 1985.

[9] Positive findings consistent with TB include, but are not limited to, the following: specimen collected which suggests or confirms a diagnosis of TB (positive AFB smear, positive NAAT for *M.tb*, positive *M. tb* culture), or chest x-ray showing abnormality consistent with TB, or initiation of treatment for TB.

III. Revising the beginning of the likely period of infectiousness

A. If you find that transmission has occurred among contacts who were exposed to the index case in a well-defined time period at the beginning of the initial likely period of infectiousness, reinterview the case regarding date of symptom onset. Consider adding two months to the beginning of the patient's likely period of infectiousness.

Example: An index case's likely period of infectiousness was initially determined to be December 1 through April 15. Two contacts with no other known exposure had close exposure to this case from December 1 through December 15 and were found to be TST converters. Because this indicated the index case likely transmitted TB in early December, the original beginning of the likely period of infectiousness, staff revised the likely period of infectiousness to October 1 through April 15 even though the case denied symptoms during this time.

B. If the index case experiences treatment failure, as defined in the CDHS/CTCA,"Guidelines for Treatment of Tuberculosis and Tuberculosis Infection for California" (4/97), the likely period of infectiousness must be extended.

C. If the likely period of infectiousness is initially based on fewer than three negative AFB sputum smear results, it may need to be revised if results from subsequent smear results are positive.

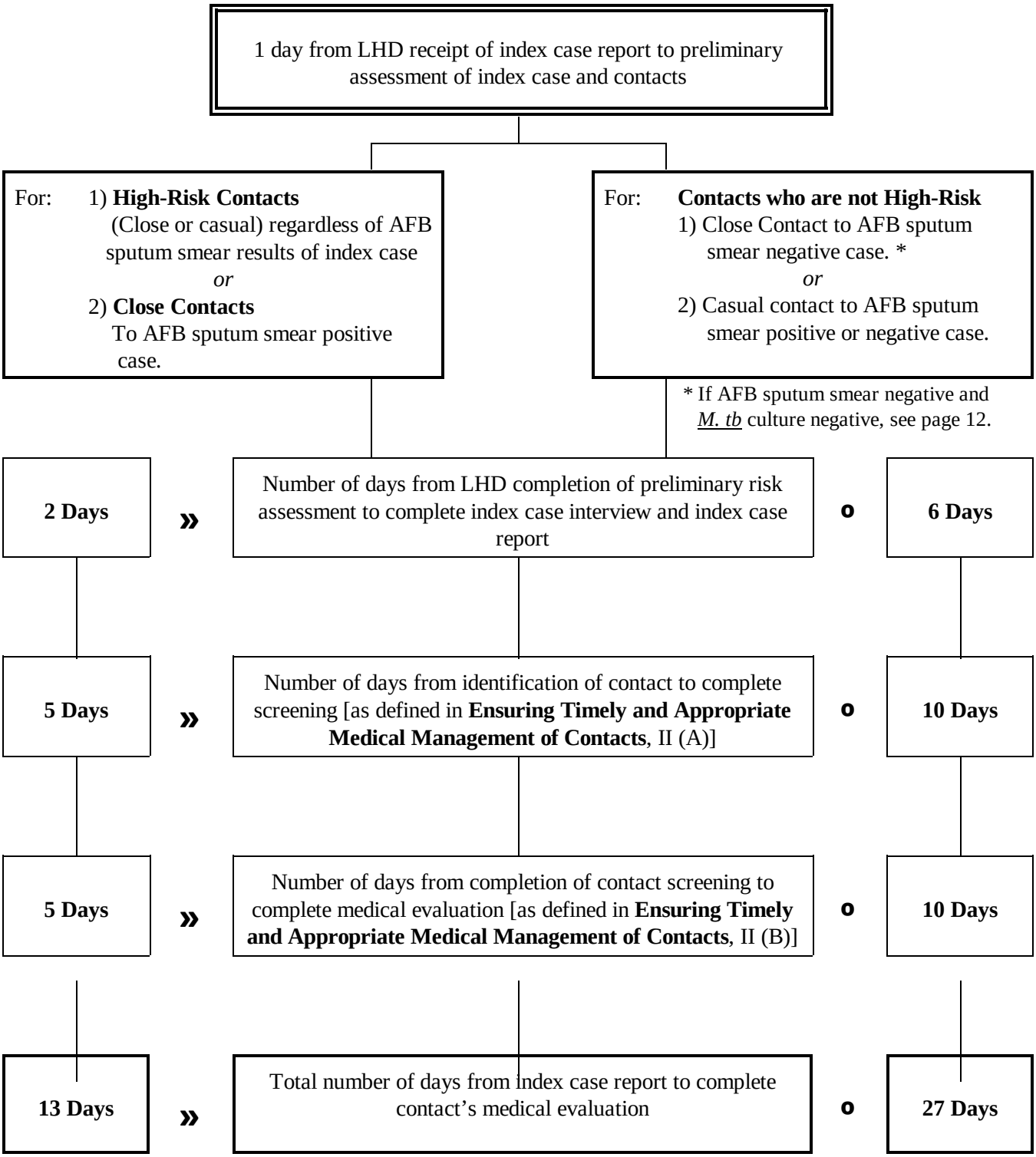
IV. Determining the end of the likely period of infectiousness

A. See CDHS/CTCA, "Guidelines for the Placement or Return of Tuberculosis Patients into High-Risk Housing, Work, Correctional, or In-Patient Settings," (4/97), **Prerequisites for Placement/Return of TB Patients Living or Working in High-Risk Settings**, for minimum criteria which suspect and known TB patients should meet to be considered noninfectious

B. In certain situations (e.g., when conversions are found on 3 month testing in AFB smear negative culture positive index cases), culture conversion should be considered as the criterion for noninfectiousness.

Appendix 5: Contact Investigation Process and Maximum Timeframes

CONTACT INVESTIGATION PROCESS AND MAXIMUM TIMEFRAMES
All days are working days.



Appendix 6: Protecting Index Case Confidentiality

Contact follow-up usually can and should be accomplished without jeopardizing index case confidentiality.

I. Confidentiality problems may occur when staff:

A. Inadvertently reveal clues about the index case

B. Provide index case information to motivate contacts to follow-up

C. Are unable to appropriately and assertively respond to uncooperative contacts

D. Incorrectly assume that index case has informed others about his or her TB diagnosis

II. Staff should use the following strategies to protect index case confidentiality

A. Use gender neutral language even when it is bad grammar.

Example: "Somebody was diagnosed with TB and they were concerned about you" instead of "A woman was diagnosed with TB and she was concerned about you."

B. Do not be manipulated into violating confidentiality by contacts who assert that they were not exposed or who refuse evaluation until they are told the index case's identity.

C. Do not mention the index case's provider, place and dates of diagnosis, or hospitalization.

D. Do not mention the environment where the exposure occurred.

Example: "You have been around somebody who has TB" instead of "You have been around somebody at work who has TB."

E. Do not specify dates of exposure.

F. When following-up on interjurisdictional referrals, do not mention which county or state initiated the referral.

III. Situations in which revealing index case information is appropriate

A. As a last resort, to protect the public health, when the contact investigation cannot be conducted unless information about the index case's TB status is revealed without prior permission

For example, if a homeless individual with untreated, AFB smear positive pulmonary TB cannot be located but is known to frequent a particular shelter, health department staff may decide it is necessary to inform the shelter manager about the index case's TB status in order to initiate timely contact follow-up.

B. When staff decide they must reveal index case information without prior permission, they should consult with a supervisor and/or the TB controller to obtain approval to breach confidentiality. This approval should be documented in the patient record. Consider the following points:

1. Have all less intrusive strategies been considered, attempted, and documented before staff violate patient confidentiality?

2. Is this breach legal and defensible in a court of law?

3. Is this breach absolutely necessary to achieve TB control activities?

C. See the attached memo, dated November 14, 1995, from the California Department of Health Services, Office of Legal Affairs, on "Disclosure of Personal Information on Patients with Tuberculosis."

Appendix 7: Overview of Methods to Notify and Interview Index Cases and Contacts

I. Notification

A. Face-to-face

B. Telephone

C. Letter

1. Appropriate method of notification when field or telephone interactions are not possible or are poor choices (e.g., index case or contact live in a remote location without telephone or PO box is the only locating information).

2. May result in unacceptable time delays, and therefore should be used as a last resort.

D. Index case notification of contact

1. Index case initially notifies his/her contacts, rather than health department staff. Staff remain responsible for obtaining contact information and ensuring the contacts receive appropriate care.

2. May be used when an index case requests or insists that s/he notifies the contacts.

3. Staff should contract with the index case to establish a time limit and method for contact notification (e.g., "Inform your contact about the TB exposure and have him call me no later than Thursday by noon to arrange his medical follow-up. If I do not hear from him by that time, I will go ahead and call him myself.")

II. Interviews

A. Face-to-face

1. General: easier than other methods to establish rapport, enlist cooperation, and comprehensively interview and assess index case and contacts.

2. Index case interviews

a. If index case infectious, interview the patient outside and/or with staff wearing appropriate respiratory protection.

b. Interviewing in the home

1) Whenever possible, interviews should be conducted in the index case's home

2) When an index case is not interviewed at home, a home visit remains necessary

c. Interviewing at other sites
   1) In situations when it is not possible to conduct a timely home visit because:
      a) Patient is currently hospitalized or, incarcerated, or infectious
      b) Patient's schedule conflicts with the assigned staff's availability
   2) Conduct interviews at a clinic, hospital, correctional facility, or at any other place convenient for the patient in order to expedite a timely investigation.
d. When the index case is interviewed outside the home, a follow-up home visit with the patient present should be conducted as soon as possible.

3. Contact interview

   a. Initially may be more time-consuming if a field visit is involved
   b. Usually the most productive and efficient interview method

II. Telephone Interview

A. Index case interview

1. Telephone interviews are not an acceptable substitute for face-to-face interviews.

2. When not possible to conduct a timely face-to-face interview (e.g., a patient who is out-of-town or resides in a very remote location), a telephone interview should be done to expedite a timely investigation.

3. A follow-up home visit should be conducted as soon as possible.

B. Contact interview

1. Can be an effective method to verbally interact with the contact, discuss contact's TB exposure, and partially assess the contact

2. May be less effective than face-to-face in establishing rapport with client and eliciting cooperation with evaluation and follow-up

3. Limits initial contact follow-up activities that can be performed

Appendix 8: Addressing Interjurisdictional Issues

For additional information, see CDHS/CTCA, "Interjurisdictional Continuity of Care Policy Statement," (4/97).

I. Responsibilities of sending county (county with index case)

A Obtain complete locating information for out-of-jurisdiction contacts and, if available, information on risk factors

B. Complete a California Confidential TB Referral Form for all contacts who reside out-of-jurisdiction, and fax to jurisdiction in which contact is located. The receiving jurisdiction will determine whether follow-up is necessary.

1. Include the date contact was broken and a summary of the results of local contact screening, if available. This will provide the receiving jurisdiction with further information on infectiousness of the index case and the extent to which screening is necessary.

2. Request 'Return Disposition' on referral form

a. Use contact screening results forwarded by the receiving jurisdiction to assess transmission and to decide whether to expand the investigation.
b. If receiving jurisdiction is unable to locate contact, contact may have returned to originating county.

C. Contact LHD to verify receipt of referral form

D. Notify receiving jurisdiction when TB disease is ruled out or confirmed in the index case. Send results of susceptibility testing.

II. Responsibilities of the receiving jurisdiction (jurisdiction in which contact is located)

A. Notify sending jurisdiction of the disposition of contacts referred in order to assist sending jurisdiction in evaluating transmission from index case.

B. Notify sending jurisdiction if additional contacts in its jurisdiction are identified by local contacts.

C. Provide sending jurisdiction with an environmental assessment of sites in which transmission may have occurred to contacts located in originating jurisdiction.

D. Notify sending county if apparently new information about the index case comes to light (e.g., contact reports he shared a jail cell with index case, in addition to spending time with him at the bar).

III. Both sending and receiving jurisdictions should use reasonable judgment and diligence in informing and working cooperatively with one another, providing updated information when it is received or requested.

Appendix 9: Preventive Therapy for Contacts

For additional information on the treatment of persons with TB infection, see CDHS/CTCA, "Guidelines for the Treatment of Tuberculosis Infection in Adults and Children (TB Class II and IV)," (4/97).

I. Duration of INH preventive therapy for contacts

TB Class	Contact Characteristics	Duration of INH Preventive Therapy	Comments
I	HIV-infected or at risk for HIV infection [10]	12 months	
I	Not HIV infected or at risk for HIV infection	Discontinue if repeat TST is negative 10-12 weeks after contact with index case is broken, or index case becomes noninfectious	Criteria for noninfectiousness shown on CDHS/CTCA, "Guidelines for the Placement or Return of Tuberculosis Patients into High-risk Housing, Work, Correctional, or In-Patient Settings," (4/97), **Prerequisites for Placement/ Return of TB Patients Living or Working in High-Risk Settings**. Other criteria, including culture conversion, may also be used.
II	Not HIV infected or at risk of HIV infection	6 months	
II	HIV infected or at risk for HIV infection	12 months	

Note 1: Persons should be considered at risk for HIV infection if they have HIV risk factors (see **Appendix 3: Factors Associated with Increased Risk of HIV Infection**), unless and until known to be HIV negative for at least 6 months following their last possible exposure or risk behavior.

Note 2: Other regimens depend on drugs used.

[10] Contacts who are HIV-infected or at risk for HIV infection, with negative TST results, should be provided preventive therapy, after TB disease has been excluded. These contacts should receive, at a minimum, window prophylaxis. The TST should be repeated 3 months after the contact is broken. If the TST is positive, 12 months of INH preventive therapy is indicated. A persistently negative TST may be used as evidence to stop preventive therapy, only if there is sufficient evidence from other contacts to rule out transmission. Most patients with HIV infection or at risk for HIV infection should complete a 12-month course of INH preventive therapy.

II. Special circumstances in preventive therapy of contacts

A. Contact with index case resistant to INH but susceptible to Rifampin:

1. Rifampin for 6-12 months.

2. Class II with history of prior positive TST or significant likelihood of prior infection who has not completed therapy: INH preventive therapy indicated for prior infection (apart from history of recent contact).

B. Contact with index case resistant to INH and Rifampin (MDR-TB):

Consult with TB control program and other experts for guidance (See Management of Persons Exposed to Multidrug-Resistant Tuberculosis. MMWR/Vol. 41/No. RR-11).

TOOLS

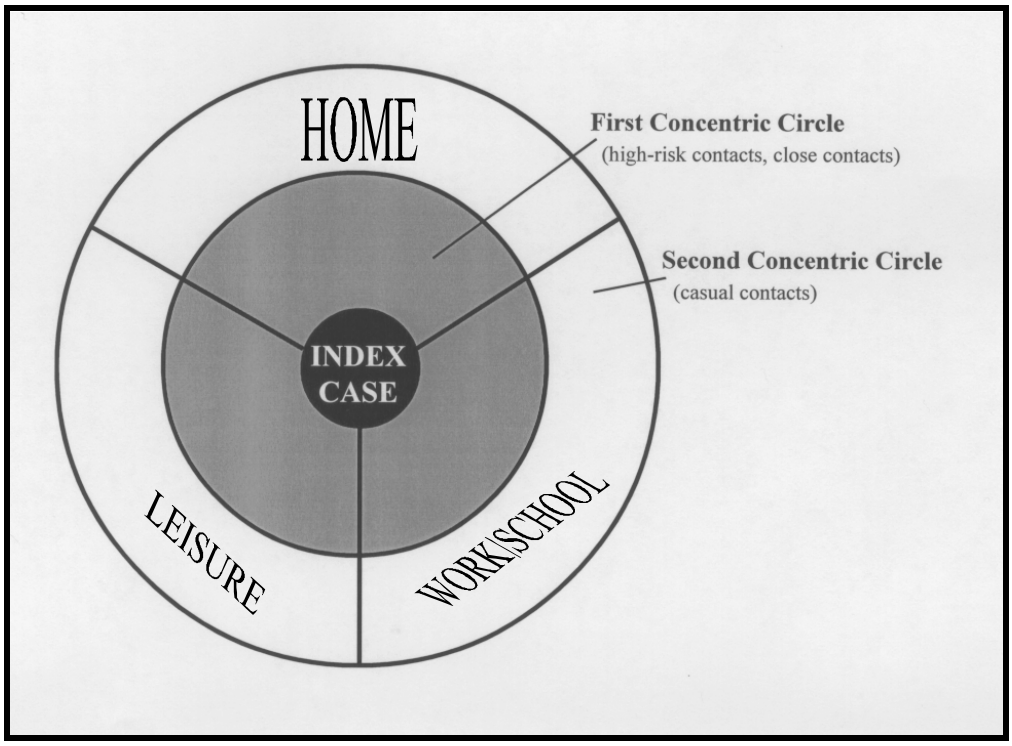
Sample Contact Roster

Using the Concentric Circle

I. Concentric circle

A. Tool to organize information about contacts and to aid decisions about conducting the investigation

B. Concentric circle diagram



Note: High-risk contacts may be either close or casual contacts. Regardless, they are always in the first concentric circle.

II How to use the concentric circle

A. Determine the concentric circle in which to classify each contact.

B. Determine the environment in which the contact should be placed.

1. Home, work/school, and leisure refer to the *index case's* home, the *index case's* work/school, and the *index case's* leisure environments during the index case's infectious period.

a. Home

1) For a definition of home, see **Interviewing the Index Case**, II (B).

2) Contacts exposed to index case in the index case's home should be considered contacts in the home environment. For example, a friend who visited the patient's home every day should be considered a contact in the home, not a leisure contact.

b. Work/school
Contacts exposed in either setting during index case's infectious period should be considered contacts in the work/school segment of the diagram.

c. Leisure
Contacts exposed where the index case socialized during infectious period

2. List contacts in only one environment. If exposure occurred in more than one environment, list contact in the environment in which greatest exposure occurred.

3. If exposure occurs in an environment other than those listed (e.g., correctional facility, nursing home) or in both a work and school environment, divide a sector in half or cross out an unused sector.

C. Interview/evaluate high-risk contacts and close contacts.

D. Organize the results

1. Classify the contacts by concentric circle segment (home, work/school, leisure). Depending on the number of contacts within the segment, it may be appropriate to stratify them based on country of origin, race/ethnicity, age, or risk factors.

2. Calculate the ratio of contacts with positive TSTs (contacts with a history of prior positive TST, positive TSTs, and documented TST conversions) to the total number of contacts evaluated in the first concentric circle within *each* segment. This calculation will yield three (3) ratios, one (1) for each segment.

3. Determine if the ratio calculated for each segment exceeds the expected infection prevalence for a population with the same demographic characteristics as the segment.

a. If resources permit, each local TB control program is encouraged to develop and maintain a surveillance system that, at a minimum, collects TST positivity rates by age, country of origin, race, ethnicity, and risk factors (e.g., homelessness, HIV infection). This data will assist in more accurately estimating the expected infection prevalence for specific populations.

If the program does not have this type of surveillance system, the following are examples of data sources that may be used to develop such a system:

1) LHD screening of non-contacts as defined in this guideline
2) Pre-employment screening in health-care facilities and other places of employment
3) Pre-employment and periodic screening of employees who are not usually exposed to *M.tb* (e.g., school teachers and school volunteers)
4) Refugee health screening
5) Drug treatment facility screening
6) Screening in homeless shelters
7) Child Health Disability Prevention (CHDP) program
8) Entry screening to child care facilities and Head Start
9) School entry screening if required by the jurisdiction

b. The jurisdiction may also use information obtained from other jurisdictions with similar demographic characteristics. Caution should be exercised in using this information if significant differences exist in the demographic characteristics of the jurisdictions.

Note: There is no single TB infection prevalence rate that can be used in all situations.

4. Determine the number of secondary cases and the number of documented converters within each segment.

E. Determine if the investigation should be expanded to the next concentric circle.

1. If the ratio of contacts with positive TSTs for any segment is significantly greater than the expected prevalence of TB infection for a population with the same demographic characteristics, expand testing to the next concentric circle. (This should be done for each segment.)

Note: The concentric circle is the ideal method for determining the scope of a contact investigation. However, when there are few contacts in a segment or concentric circle, it may be difficult or impossible to establish evidence of transmission. In these situations, other factors, including public relations, may enter into the decision to expand the investigation to the next concentric circle.

2. If the ratio of contacts with documented TST conversions to the total number of contacts evaluated in the segment indicates significant transmission in the first concentric circle, consider expanding to the next concentric circle within the segment.

3. If secondary cases have been identified in the first concentric circle, consider expanding to the next concentric circle within the segment. (A separate concentric circle analysis should be performed on each infectious secondary case identified.)

4. If there are a number of contacts who have not been evaluated, or are TST negative and require a 3-month follow-up, consider calculating a projected ratio before ruling out expanding to next concentric circle.

For example: If delaying the decision to expand to the next concentric circle might result in missed opportunities for early intervention, assume the worst case scenario. Recalculate the ratio by assuming that contacts who have not been evaluated initially and TST negative contacts awaiting their 3-month retest are newly positive or TST converters. This may result in a decision to expand to the next concentric circle in a situation where the original ratio may have been borderline.

5. If transmission cannot be confirmed or ruled out among inner-circle contacts within the segment because of immunosuppression, expand testing to the next concentric circle. (This should be done for each segment.)

6. Continue expanding to the next concentric circle, as feasible, or until there is no evidence of transmission

Prioritizing Activities: Contact Investigation Priority Scoring System

I. Background

The contact investigation priority scoring system was developed to provide a systematic approach to priority setting in the contact investigation. Priority scoring integrates index case, environmental, and contact risk factors into a single score for each index case and contact. The scoring system may be used to:

A. Set priorities for index case interviews and contact follow-up in one or more contact investigations

B. Provide guidance on appropriate thoroughness of contact follow-up

C. Aid first-line supervisors in distributing case loads among employees

D. Teach new staff about the relative weighting of key factors in contact investigation.

The priority score will often change over time as new information is collected and old information is updated and revised. This tool will be most useful if it is updated to accurately reflect the most recent information. Local jurisdictions may change the assigned scores associated with each risk factor on the Priority Score Worksheet as experience directs.

II Steps for Using the Priority Scoring System

A. As soon as the case report is completed, review the Priority Score Worksheet. Using all available information about the index case, environments in which transmission may have occurred, and contacts, place checks in appropriate boxes. At this point, much information will not yet be available, and the scores should be revised as you gather more information.

B. Add the numbers in parentheses corresponding to each checked box, and record the total.

C. Incorporate information obtained from each contact to revise and update the contact's priority score.

Priority Score Worksheet

Index Case Scores

- ” **(5)** AFB sputum smear positive
- ” **(3)** Cavitary disease on chest x-ray
- ” **(4)** Cough
- ” **(3)** Inadequate prior treatment for TB disease
- ” **(5)** MDR-TB (resistant to INH and Rifampin)
- ” **(2)** Positive culture for *M. tb*.

Environmental Scores

- ” **(2)** Poor natural ventilation (e.g., closed windows, doors)
- ” **(2)** Poor mechanical ventilation (e.g., low airflow rate, recirculated air, no UV)
- ” **(3)** Small indoor space
- ” **(5)** High-risk congregate site (e.g., shelter, correctional, or health care facility)

Contact Scores

- ” **(6)** HIV-infected, or at risk for HIV infection and results of HIV testing pending or HIV testing declined
- ” **(3)** Other medical conditions associated with increased risk of progression to TB disease
- ” **(6)** < 4 years old
- ” **(3)** Close contact
- ” **(1)** No documented prior history of positive TST

____ TOTAL SCORE

Using the Contact Investigation Priority Score

I. Setting Priorities Within One Contact Investigation or Between Two or More Contact Investigations

Conduct follow-up on contacts identified in the same time period based on priority score (i.e., provide follow-up first to contacts with the highest scores, and last to contacts with lowest scores).

II. Distributing Case Loads Equitably Among Employees

Assign caseload among employees so that during the same time period, the sum of *total* priority scores for each employee's caseload is approximately equal.

Note: The particular challenges associated with each case/contact should also be taken into account in determining workload.

III. Determining Thoroughness of Contact Follow-Up

Use the priority score of each contact to determine thoroughness in contact follow-up (i.e., the most thorough contact follow-up should occur in contacts with highest score and least thorough in contacts with lowest score, assuming that program resources are limited).

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